



KES Enviro Engineering Manual

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KES Enviro Engineering Manual

INTRODUCTION

The SPRING AIR SYSTEMS INC. Kitchen Enviro System (KES) has been designed and constructed specifically for a commercial kitchen exhaust. The units are simple to operate and easy to maintain. The individual components have been selected to provide trouble free, reliable operation.

The KES and KRS units are built-in accordance to the National Building Code, National Fire Protection Association (NFPA-96) and listed by the Underwriters Laboratories of Canada and Underwriters Laboratories Inc.

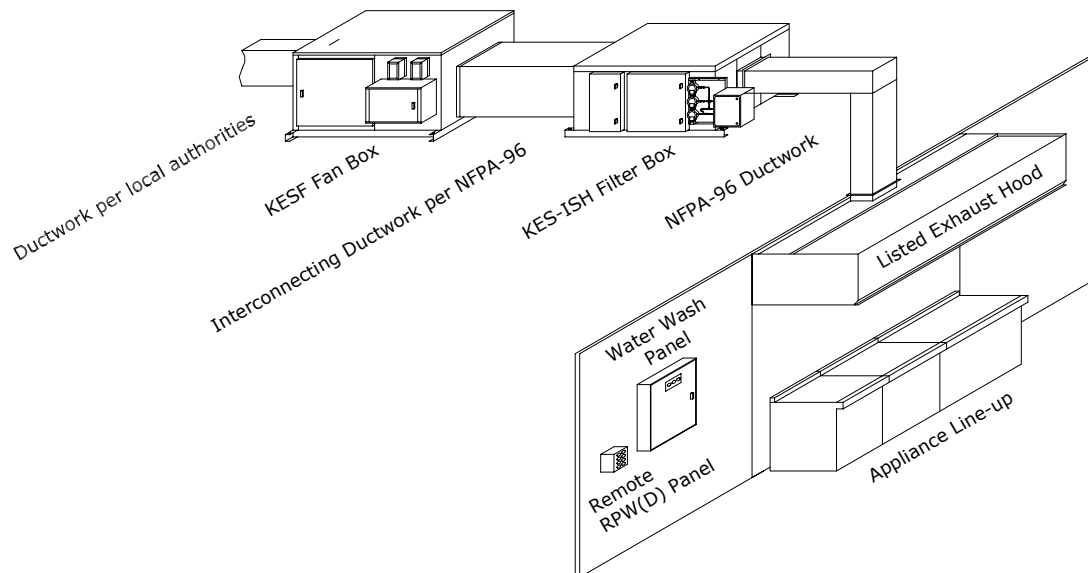
NOTE: PRIOR TO ANY KES INSTALLATION THE INSTALLER MUST SEEK THE APPROVAL OF THE AUTHORITY HAVING JURISDICTION.

KES ENVIRO UNIT

The KES unit provides manageable alternatives to the most difficult commercial kitchen exhaust installation problems.

Here's a few;

- when installing an "all-welded NFPA-96" exhaust duct from the kitchen to the roof is not feasible.
- when the installation of extremely long runs of exhaust duct sends construction cost skyrocketing. The KES unit can be discharged at low levels.
- when discharging the grease laden kitchen exhaust presents an unusual fire hazard or maintenance problem.
- when the kitchen exhaust discharge odor is offensive.



*Typical Enviro Unit Installation with Water Wash Hood
Figure 1*

The KES unit is installed to clean the exhaust air of grease and odor. The UL/ULC listing allows the exhaust to be discharged at low levels.

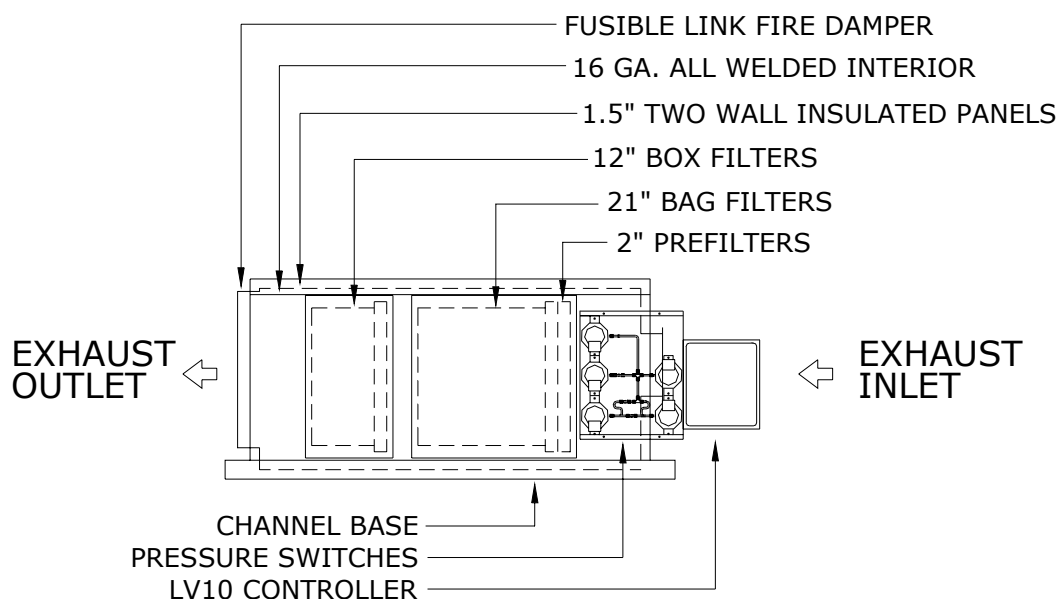
In other words the exhaust ductwork may be discharged through side exterior walls below the roof level. These exceptions to the standard NFPA-96 code are possible with a combination high efficiency filtration system and a unique electrical and mechanical safety circuit.

*The KES Enviro unit is available in sizes ranging from
1,000 to 40,000 CFM*

(475 to 19,000 l/s), horizontal or vertical arrangement, (vertical units are available up to 8,000 CFM (3,800 l/s) indoor or outdoor design, and for use with dry hoods or water wash ventilators. A few typical applications are shown in Figure No. 1.

PRINCIPLE OF OPERATION

The grease-laden air rises from the cooking equipment into the UL/ULC, commercial kitchen exhaust hood. The exhaust hood will remove some of the airborne grease, lint and dirt particulate. Typically most micron and submicron particle escape into the ductwork. The exhaust air is then ducted directly to the inlet of the KES *Enviro Filter Unit*. This exhaust duct from the commercial kitchen exhaust hood to the inlet of the KES Enviro must be installed in strict accordance with the NFPA-96 code.



*KES-ISH Plan View of Filter Box Schematic
Figure 2*

Within the *KES Enviro Filter Unit (KES-ISH)* the exhaust air travels through three stages of particulate filters.

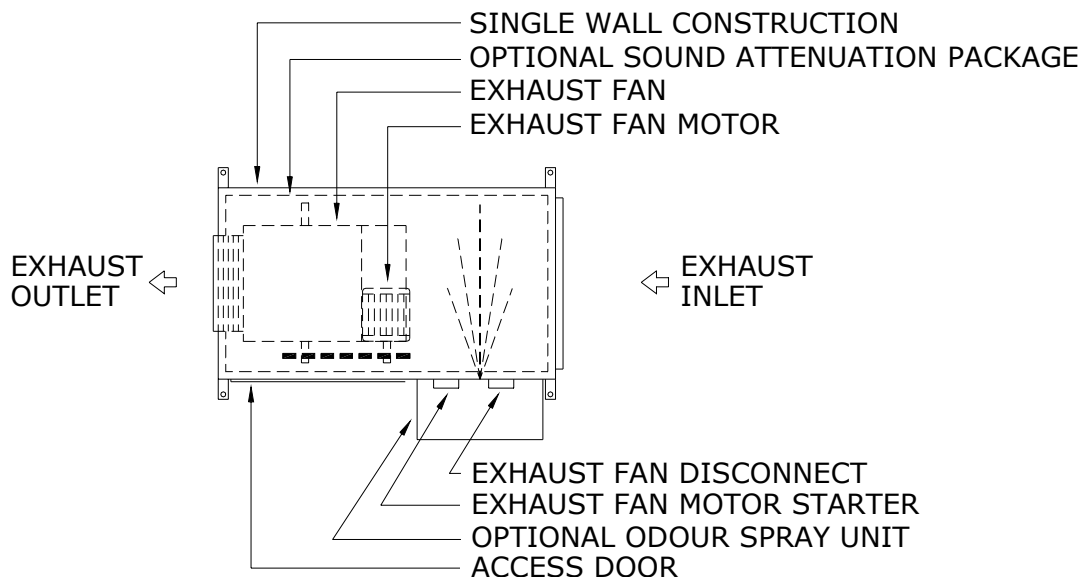
1. Two (2) inch (51 mm) pleated - 30% ASHRAE 52-76 filters
2. Twenty-one (21) in. (525 mm) bag - 90% ASHRAE 52-76 filters
3. Twelve (12) in. (305 mm) box - 95% DOP filters, (99% ASHRAE 52-76)

Within the *KES Enviro Filter Unit (KES-ISH)* the exhaust air is cleaned of airborne grease, lint and dirt particulate. Once through the *KES Enviro Filter Unit (KES-ISH)* the exhaust air enters *KES Enviro Fan Unit (KESF)*.

The *KES Enviro Fan Unit (KESF)* is a separate package containing the exhaust fan, motor, belts, drives, motor starter, disconnect and the optional odor removal section. There are two options available for odor reduction:

1. **PELLETS:** The section consists of metal cells filled with activated alumina pellets impregnated with potassium permanganate. The odor is controlled through a combination of sorption and a chemical modification of the gaseous contaminants. The odor media is non-toxic and non-flammable.
2. **SPRAY:** The section consists of an atomizing air nozzle, air compressor, timing control circuit, associated piping, and a container of *Spring Fresh* deodorizer. The *Spring Fresh* solution is sprayed at an adjustable interval for an adjustable time into the exhaust ductwork to reduce the commercial kitchen odors.

After leaving the *KES Enviro Fan Unit* the air is discharged to atmosphere. The Spray or Pellet odor reduction section is located in the KESF enviro fan unit or shipped for remote installation.

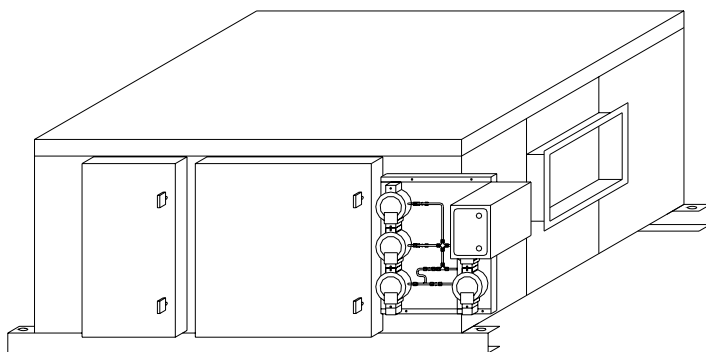


KESF Fan Box Plan View
Figure 3

KES ENVIRO FILTER UNIT (KES-ISH)

The *KES Enviro Filter* unit contains the LV10 panel, pressure switches, and three stages of filters.

The unit is constructed of 16 gauge steel inner shell, continuously welded and liquid tight in accordance with the NFPA-96. The outside of the unit is wrapped in 1.5" insulation and 18 gauge steel protective covering primed and painted. Channels running along the length of each side support the unit. Lifting and support points are at the four corners of the KES-ISH unit at the ends of these channels. No external isolation of the unit is required. The two access doors are double wall construction with 1.5" insulation and cam lock door fasteners per the UL/ULC fire rated listing.



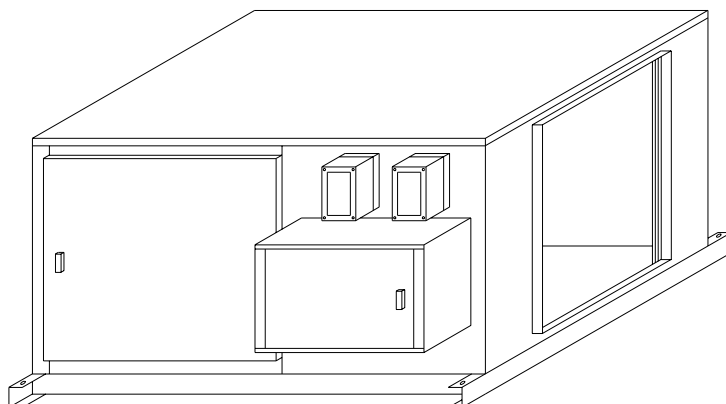
A fusible link fire damper is located at the outlet of the KES-ISH filter unit. The link temperature is 165F and is accessible through the Prefilter/Bag filter access door. Pressure tubing from the pressure switches is run inside along the top of the unit to pressure probes located in front and behind each filter section. The firestat is located at the exhaust inlet end and mounted on the same side as the LV10 panel.

KES-ISH Enviro Filter Box
Figure 4

KESF ENVIRO FAN UNIT

The *KESF Enviro Fan* unit contains the exhaust fan, exhaust fan motor, drives, and belts, disconnect, motor starter, isolators and optional odor reduction sections, spray or pellets.

The unit casing is 16-gauge steel, primed and painted suitably reinforced to ensure rigidity. An optional sound attenuation package is available for the interior of the fan unit. This package is highly recommended on all indoor units. Channels running along the length of each side support the KESF unit. Lifting and support points are at the four corners of the KESF unit at the ends of these channels. An access door is provided to the exhaust fan motor and drive section.



KESF Enviro Fan Unit
Figure 5

Every KESF unit is equipped with a backward Inclined; AMCA rated, Class II, exhaust fan with heavy-duty bearings, and two groove sheaves. The following options are also available:

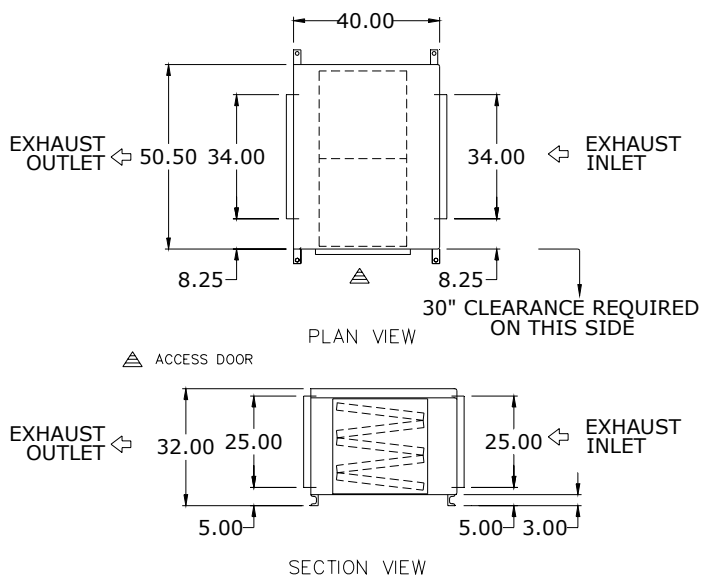
The KESF fan unit is always **internally** isolated. The KESF fan unit has spring mounted isolators inside the KESF fan unit and does not require any external flexible connection outside the unit.

The KESF fan unit has a **Class II**: The Class of the fan is dependent on the total static pressure and CFM of the system. The Class II blower will handle up to 7.5" W.C. total static pressure.

Single Width, Single Inlet (SWSI) or Double Width, Double Inlet (DWDI): The standard unit comes with a **DWDI** fan package. The DWDI is preferred when the exhaust discharge is straight through the KESF Fan unit. The DWDI can also discharge up or down from the KESF fan unit but not out the sides. DWDI exhaust fans up to 8,000 CFM are stocked at the Spring Air factory.

The **SWSI** fan is preferred if the exhaust discharge from the KESF Enviro fan unit is required to be at right angles (Out the Side) to the exhaust discharge.

Odor Spray or Odor Pellets or NONE: Odor reduction is required if the exhaust discharge is to be located in an area where the smell could be a nuisance. The choice of Pellets or Spray is a personal preference. The Pellets are generally changed once a year while the Spray bottle is changed every one to two months.

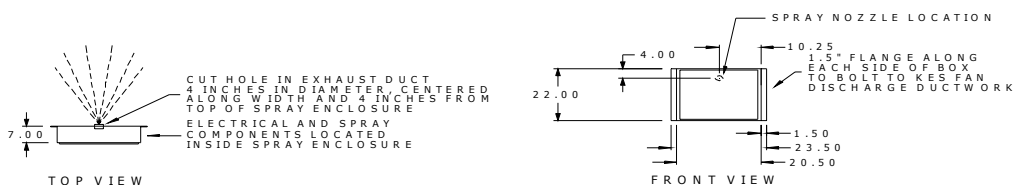


The **Pellets** are contained in 24" x 24" x 2" and 12" x 24" x 2" perforated cells located in a separate odor reduction section normally located between the KES-ISH filter box and the KESF fan box. There are no moving parts and the odor reduction is continuous. All of the exhaust air is drawn over the pellets whenever the fan is operating. The cells are removed through a side access door on the odor section. The cells split in two to remove the used pellets and add new pellets.

Remote Pellet Odor Reducing Unit (Model OP40 Shown)
Figure 6

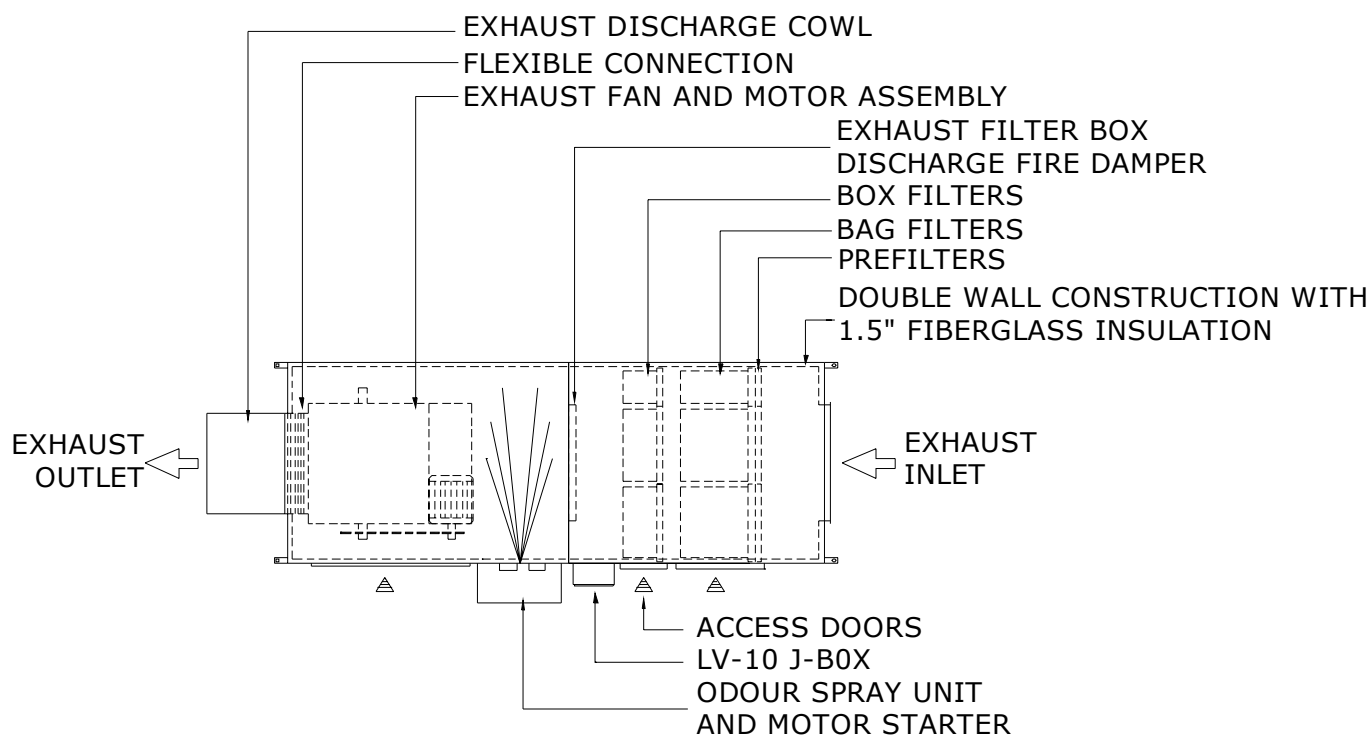
The **Spray** system contains a spray compressor, nozzle, associated piping, and odor spray container. The timer control is located in the remote panel. The spray unit is located in the KESF fan unit or in a separate remote unit. When the spray unit is located in the KESF fan unit the wiring is completed by Spring Air. If a remote odor spray unit is used a 120V/1/60 interlock from the KESF section is required. While the exhaust fan is operates the spray is cycled every 0 to 10

minutes for a preset spray time. Both the cycle time and the length of spray are adjustable. The time setting relates to the type of cooking and appliances under the hood. See Figure 7.



*Remote Spray Odor Reducing Unit
Figure 7*

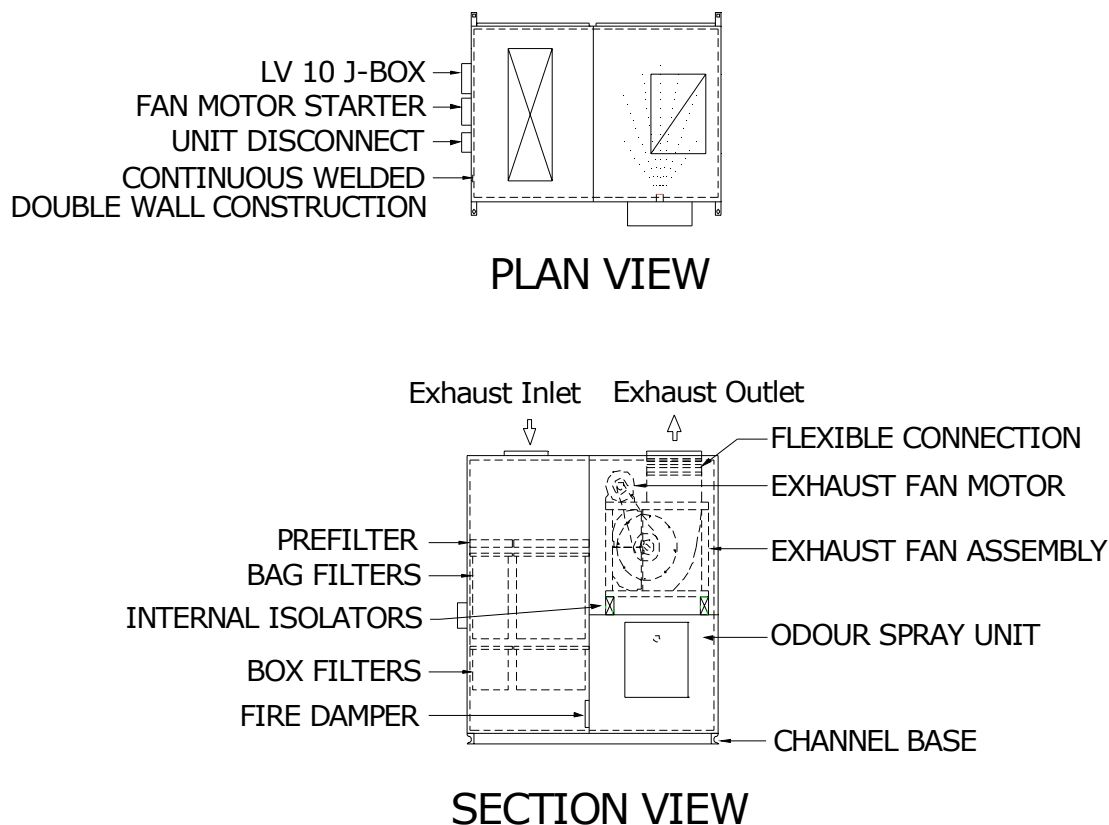
Other options include **indoor or outdoor units**. Both the KES-ISH filter box and the KESF fan unit section can be located outdoors as a single unit or just the KESF fan unit can be located outdoors on a prefabricated roof curb.



*Outdoor Complete Unit with Odor Spray (Model KES100 shown in plan view)
Figure 8*

INDOOR VERTICAL UNITS

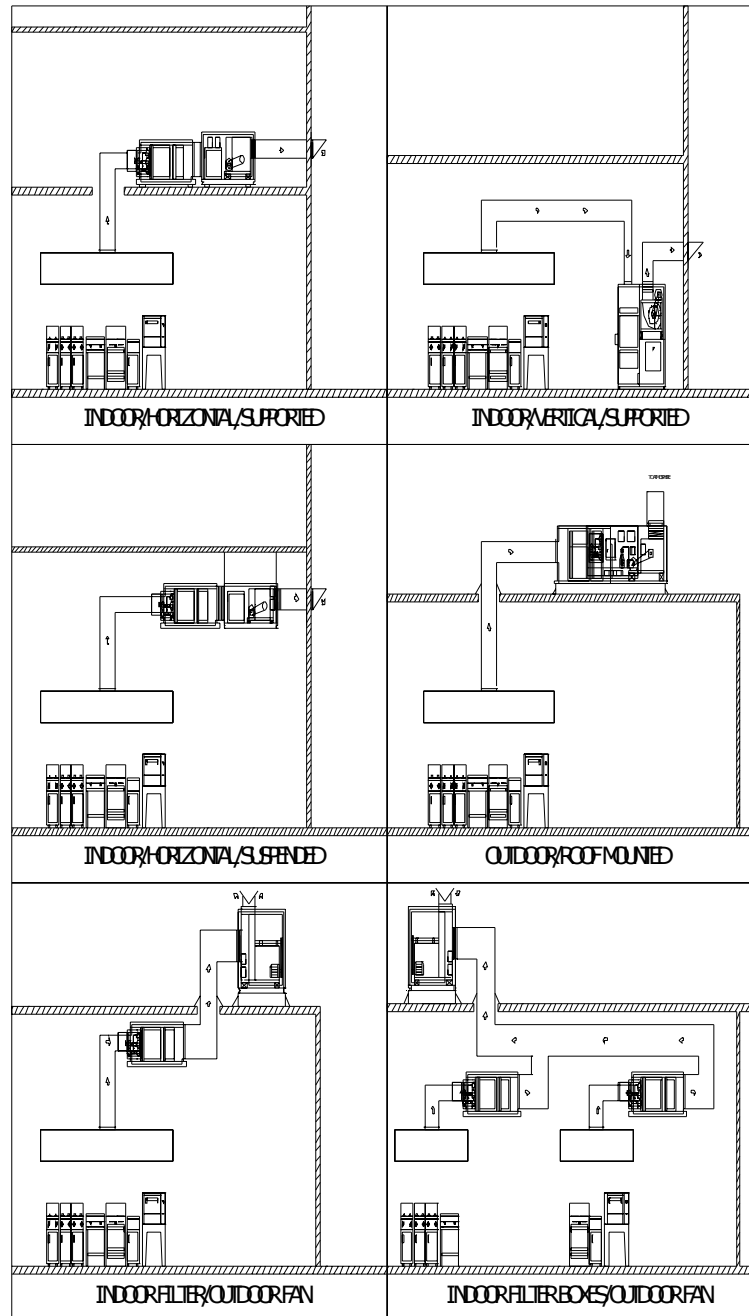
Indoor, **vertical units** are also available for exhaust volumes up to and including 10,000 CFM. The unit is generally located beside the hood or in a mechanical room on the floor.



*Indoor Vertical Complete Unit with Odor Spray (Model KES60-IV shown)
Figure 9*

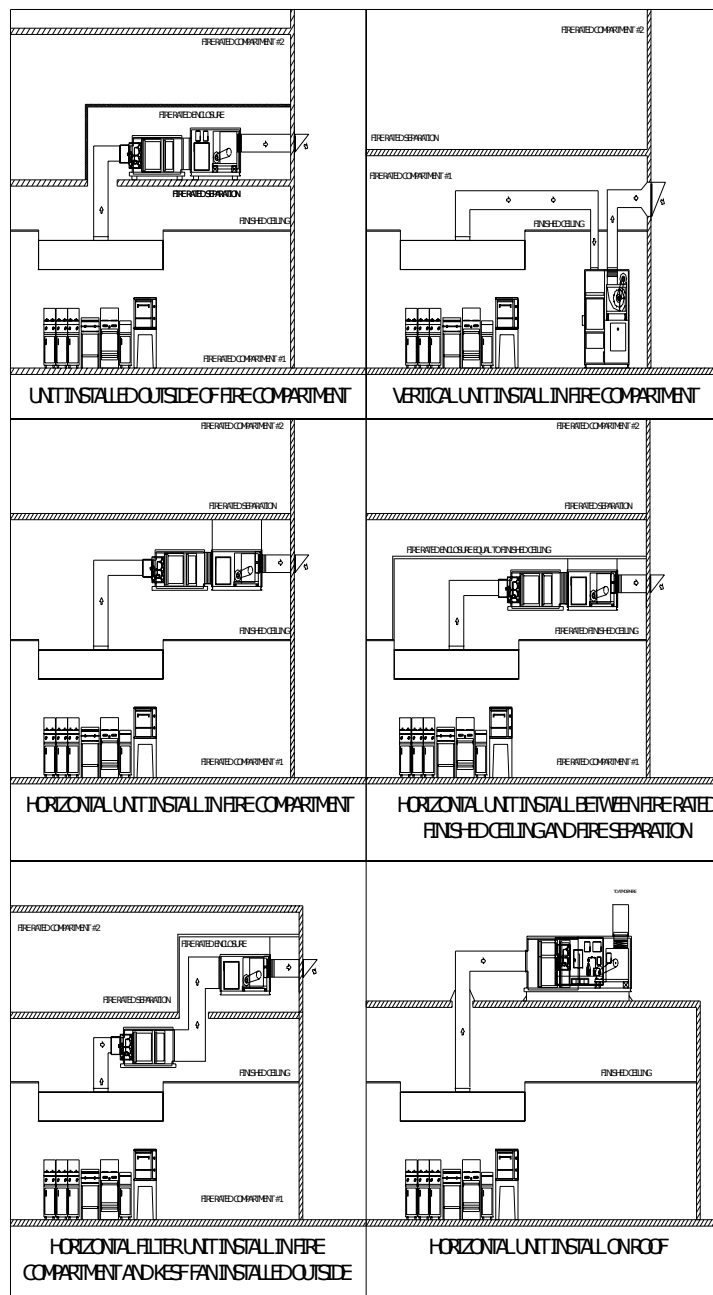
There are many arrangements possible using Spring Air Systems KES Enviro Units. Figure 10 above outlines some of the most common installation arrangements. Consideration must be made when a fire rated enclosure is required for the NFPA-96 exhaust ductwork. The KES-ISH filter box is UL/ULC listed but it is still considered an extension of the NFPA-96 exhaust ductwork. Generally, when the KES-ISH filter box is located in the same fire rated compartment as the exhaust hood and exhaust ductwork no fire rated enclosure is required. But, the local authorities having jurisdiction must be consulted for every application as requirements change from municipality to municipality.

FAN ARRANGEMENTS



Typical KES-ISH Filter Box and KESF Fan Arrangements
Figure 10

FAN INSTALLATION IN FIRE COMPARTMENTS

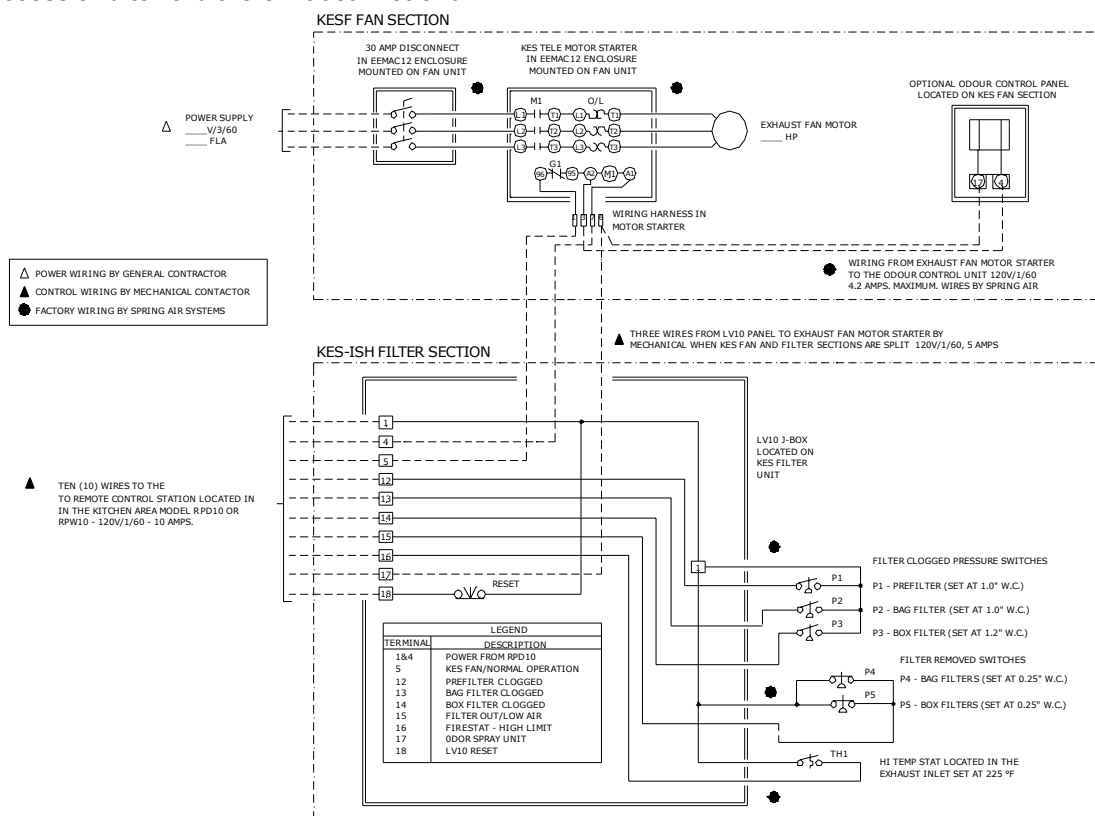


KES-ISH Filter Box and KESF Fan Installation in Fire Compartments
Figure 11

KES-ISH ENVIRO BOX CONTROLS

LV10 J-Box

The main Enviro Unit interlocks from the remote panels is the LV10 J-Box located on the **KES Enviro Filter Box (KES-ISH)**. The LV10 j-box is located on the same side of the **KES-ISH** as the filter access and toward the exhaust inlet end.



Typical LV10 J-Box for Indoor KES-ISH with Odor Spray
 Figure 12

RPW10 Remote Annunciation Panels

Used in conjunction with a Water Wash Ventilator

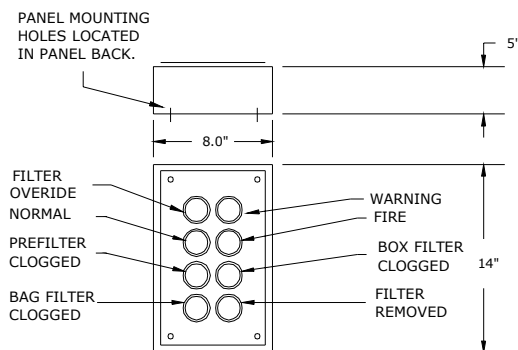
The KES RPW10 remote control panel activates unit shut down upon any of the conditions listed below.

- 1.Operation of the KES-ISH with dirty or clogged pre-filters, bag filters, or box filters.
- 2.Operation of the KES-ISH with the bag for box filter removed.
- 3.Low air volume through the KES-ISH.
- 4.A fire in the KES-ISH inlet

The remote annunciation panel RPW10 is located in the kitchen near the water wash control for annunciation of the following conditions:

NORMAL: Exhaust airflow is normal and the unit is functioning properly.

FIRE: There is a temperature in excess of 225 F in the KES-ISH inlet. The unit will shut off completely.



RPW10 Remote Panel
Figure 13

PRE FILTER CLOGGED:

Operation will stop. The 2" deep pre-filter located in the KES-ISH filter unit is plugged and must be replaced.

BAG FILTERS CLOGGED

Operation will stop. The 22" deep bag filter located in the KES-ISH filter unit is plugged and must be replaced. Rotate the warning switch and the unit will resume operation. Change filter immediately after cooking is completed for the day.

BOX FILTERS CLOGGED:

Operation will stop. The 12" deep box located in the KES-ISH filter unit is plugged and must be replaced. Rotate the warning switch and the unit will resume operation. Change filter immediately after cooking is completed for the day.

FILTERS REMOVED:

Operation will stop. The bag or box filter has been removed from the KES-ISH filter unit. Operation will stop until the filters are replaced.

WARNING:

The override switch has been switched on. The PRE, BAG, or BOX filter must be replaced immediately after cooking has ceased for the day.

Override Switch:

Rotating this switch provides approximately 4 hours to change the dirty filter that has annunciated. Failure to change the dirty filter will cause the complete unit to shutdown.

The KES Enviro on/off operation is controlled from the water wash hood panel. (See the *Spring Air Ventilator Engineering Manual* for detailed information about water wash control panels available.)

The water wash system requires three (3) wire 120/1/60, 10 amp from water wash control panel to the RPW10 remote panel and ten (10) wires from the RPW10 remote panel to the LV10 J-box located in the kitchen.

RPD10 Remote Annunciation Panels

Used in conjunction with a Dry Hood (Dry Extractor or Filter Hood)

The KES RPD10 remote control panel activates unit shut down upon any of the conditions listed below.

1. Operation of the KES-ISH with dirty or clogged pre-filters, bag filters, or box filters.
2. Operation of the KES-ISH with the bag or box filter removed.
3. Low air volume through the KES-ISH.
4. A fire in the KES-ISH inlet

The remote annunciation panel RPD10 is located in the kitchen near the water wash control for annunciation of the following conditions:

NORMAL:

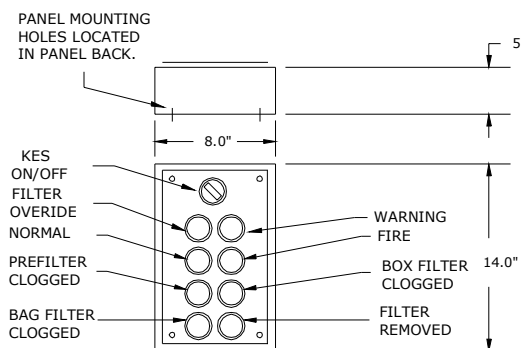
Exhaust airflow is normal and the unit is functioning properly.

FIRE:

There is a temperature in excess of 225 F in the KES-ISH inlet. The unit will shut off completely.

PRE FILTER CLOGGED:

Operation will stop. The 2" deep prefilter located in the KES-ISH filter unit is plugged and must be replaced.



*RPD10 Remote Panel
Figure 14*

BAG FILTERS CLOGGED

Operation will stop. The 22" deep bag filter located in the KES-ISH filter unit is plugged and must be replaced. Rotate the warning switch and the unit will resume operation. Change filter immediately after cooking is completed for the day.

BOX FILTERS CLOGGED:

Operation will stop. The 12" deep box located in the KES-ISH filter unit is plugged and must be replaced. Rotate the warning switch and the unit will resume operation. Change filter immediately after cooking is completed for the day.

FILTERS REMOVED:

Operation will stop. The bag or box filter has been removed from the KES-ISH filter unit. Operation will stop until the filters are replaced.

WARNING:

The override switch has been switched on. The PRE, BAG, or BOX filter must be replaced immediately after cooking has ceased for the day.

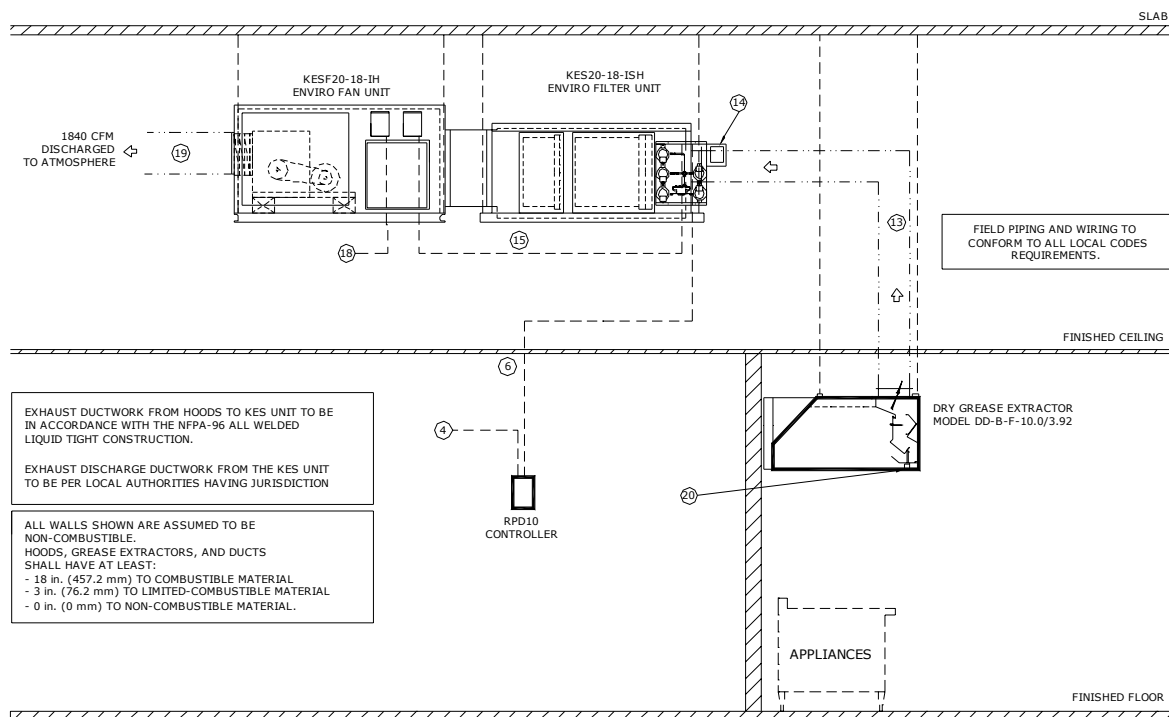
Override Switch:

Rotating this switch provides approximately 4 hours to change the dirty filter that has annunciated. Failure to change the dirty filter will cause the complete unit to shutdown.

Unit on/off Switch:

Rotating this switch turns the KES Enviro system on and off.

This control system requires eleven (11) wires from the LV10 J-Box to the RPD10 remote panel located in the kitchen.



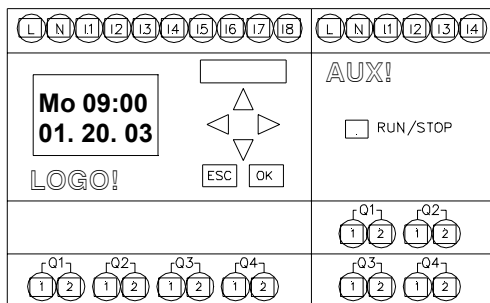
Typical Remote Wiring for Dry Hood
Figure 15

RPD10A Remote Annunciation Panel for automatic operation

Used in conjunction with a Dry Hood (Dry Extractor or Filter Hood)

The KES RPD10A remote control panel provides 24-hour/7 day operation and activates unit shut down upon any of the conditions listed below.

- 1.Operation of the KES-ISH with dirty or clogged pre-filters, bag filters, or box filters.
- 2.Operation of the KES-ISH with the bag for box filter removed.
- 3.Low air volume through the KES-ISH.
- 4.A fire in the KES-ISH inlet



The RPD10A remote panel functions the same as the standard RPD10 except the microprocessor has the additional capability of setting on/off operation three times a day and 7 days per week.

RPD10A Microprocessor with clock
Figure 16

KES SELECTION

Two parameters are required to select a KES unit; the total exhaust volume, CFM (l/s) and the external static pressure, inches W.C. (kpa). To minimize the initial capital cost and future operation and maintenance costs the most important consideration is to reduce the total exhaust air volume.

Spring Air Systems sales representatives have a KES Enviro selection computer program. Contact your local representative and a selection can be made in minutes.

KESF Fan Chart Horizontal Arrangement, DWDI fan 1000 CFM to 10,000 CFM

KES	CFM	External Static Pressure ("W.C.") *									
		1.50		1.75		2.00		3.00		4.00	
		HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM
10	1000	1.80	2807	1.91	2870	2.02	2932	2.47	3167	2.95	3386
20	1500	1.42	2352	1.52	2424	1.63	2495	2.45	2946	2.95	3176
20	2000	2.67	2866	2.81	2926	2.94	2984	3.51	3208	4.09	3419
30	2500	2.50	2635	2.64	2698	2.79	2760	3.38	2995	4.00	3214
30	3000	3.84	3022	4.01	3077	4.18	3131	4.87	3338	5.58	3535
40	3500	3.72	2120	2.72	1857	4.14	228	5.00	2402	5.90	2574
40	4000	5.10	2343	5.33	2387	5.57	2431	6.53	2599	7.52	2758
50	4500	5.00	2258	5.25	2303	5.49	2348	6.50	2520	7.53	2681
50	5000	6.45	2450	6.72	2492	6.99	2533	8.08	2691	9.20	2842
60	5500	5.89	1975	6.19	2017	6.49	2059	7.72	2217	8.99	2367
60	6000	7.25	2110	7.57	2150	7.90	2188	9.22	2338	10.6	2479
80	7000	7.23	2037	7.58	2076	7.93	2114	9.36	2263	10.8	2404
80	8000	10.0	2266	10.1	2275	10.8	2334	12.4	2468	14.0	2596
100	9000	9.15	1822	9.61	1858	11.6	1998	12.1	2031	14.1	2163
100	10000	11.8	1979	12.3	2012	12.8	2044	14.9	2170	17.1	2292

* The above chart includes internal static pressure of the KES-ISH, and KESF fan unit. The chart is for a DWDI exhaust fan in a vertical or horizontal arrangement either indoor or outdoor design. For other selections call your local Spring Air Systems representative. "External Static Pressure" above must include items a, b, d, e & f.

Chart No. 1

The SPRING AIR SYSTEMS "MIN AIR" kitchen hood method, is a practical and cost effective approach to reducing the total exhaust required. Refer to the "SPRING AIR SYSTEMS Ventilator Engineering Manual" for detailed "MIN AIR" calculations. To complete these calculations the designer requires only the proposed kitchen appliance line up.

The total exhaust volume must equal the sum total of the entire kitchen exhaust hoods connected to the KES unit.

The external static pressure is made up of many components.
Here are a few to consider:

- a) Spring Air Kitchen exhaust hood - typically between 0.5 to 1.5" W.C. (0.13 to 0.33 kpa)
Calculated by Spring Air.
- b) Exhaust inlet ductwork from the hood to the KES-ISH filter box.
- c) Internal Static Pressure of KES-ISH filter box - typically between 2.0 to 3.5" W.C. (0.50 to 0.88 kpa). Calculated by Spring Air.
- d) Exhaust ductwork from the KES-ISH filter unit to the KESF fan unit. The minimum allowable velocity is 1500 fpm (7.6 m/s).
- e) Exhaust discharge ductwork from the KESF fan unit to atmosphere.
- f) Exhaust discharge cowl (Typically 0.25" W.C.) (0.06 kpa).

KESF Fan Chart Horizontal Arrangement, DWDI fan 15,000 CFM to 40,000 CFM

KES	CFM	External Static Pressure ("W.C.) *									
		1.50		2.00		2.50		3.00		4.00	
		HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM
120	12000	13.8	1746	15.0	1805	16.3	1862	17.5	1919	20.2	2029
140	13000	13.8	1722	15.0	1779	16.2	1835	17.5	1890	20.1	1997
140	14000	16.5	1830	17.8	1883	19.1	1936	20.4	1987	23.2	2089
160	15000	16.9	1827	18.2	1879	19.5	1930	20.8	1980	23.6	2079
160	16000	19.9	1929	21.2	1978	22.6	2026	24.0	2074	26.9	2167
180	17000	18.4	1557	20.0	1606	21.6	1654	23.3	1703	26.7	1796
180	18000	21.3	1632	23.0	1679	24.6	1725	26.4	1771	29.9	1860
200	19000	21.5	1629	23.2	1675	24.9	1721	26.7	1766	30.2	1853
200	20000	24.5	1700	26.2	1744	28.0	1788	29.8	1831	33.5	1915
240	22000	22.8	1366	24.8	1409	26.9	1452	29.0	1494	33.4	1576
240	24000	28.3	1467	30.5	1507	32.7	1547	35.0	1586	39.6	1662
280	26000	28.8	1470	31.2	1512	33.5	1550	35.8	1588	40.61	1662
280	28000	35.0	1570	37.4	1606	39.8	1642	42.3	1677	47.3	1747
320	30000	32.5	1280	35.1	1316	37.8	1352	40.4	1387	46.0	1456
320	32000	38.3	1351	41.1	1385	43.8	1419	46.7	1452	52.5	1518
360	34000	35.9	1081	38.9	1115	42.0	1148	45.2	1181	51.7	1246
360	36000	41.4	1134	44.6	1166	47.8	1198	51.2	1229	58.0	1290
400	38000	48.5	1195	45.2	1165	48.5	1195	42.0	1286	58.7	1286
400	40000	47.9	1183	51.2	1213	54.6	1243	58.1	1272	65.3	1329

* The above chart includes internal static pressure of the KES-ISH, and KESF fan unit. The chart is for a DWDI exhaust fan in a vertical or horizontal arrangement either indoor or outdoor design. For other selections call your local Spring Air Systems representative. "External Static Pressure" above must include items a, b, d, e & f.

Chart No. 2

Once the exhaust volume and external static pressure have been calculated refer to the KES FAN CHART. The charts above include the KES-ISH and KESF internal static pressure. Move down the CFM column to the KES model that corresponds to the exhaust air capacity. Continue across to the External Static Pressure column. Read the fan RPM and brake horsepower.

Sample Selection

A hospital cafeteria is expanding the kitchen. An additional SPRING AIR SYSTEMS water wash hood model HF-B 10.4 is to be installed. The cafeteria is located on the first floor of a four-(4) story section of the hospital. The exhaust must discharge at the ground floor level into a courtyard. A SPRING AIR SYSTEMS kitchen enviro system (KES) is required.

Water wash hood: CD-B 10/4
 Length: 10 ft.
 Width: 4 ft.
 Exhaust volume: 3,000 CFM
 External Static Pressure: 1.26" W.C.
 Ductwork:
 Twenty (20) equivalent feet from hood to KES unit.
 Eighty (80) equivalent feet from KES unit to exterior wall.
 Discharge cowl and birdscreen on exterior wall.

Calculations:

A. Total External Static Pressure
 Hood = 1.26" W.C.
 Ductwork:
 $(20 + 80) \times 0.15" \text{ W.C.} / 100 \text{ ft} = 0.15" \text{ W.C.}$
 Discharge cowl = 0.34" W.C.
 Total External Static = 1.75" W.C.

B. Refer to KES FAN CHART at 3000 CFM and 1.75" W.C. Select KES30 with 4.66 HP, and 2766 rpm. The SPRING AIR SYSTEMS Model KES30-30-IH KES unit, indoor design, horizontal arrangement, with 5.0 HP motor. This unit is a combination of a KES30-30-ISH Filter box and a KESF30-30-IH fan unit.

Engineering Data

Project Name:	- Sample
Item Number:	- H-1
Model Number:	-CD-B-10/4
Number of Sections:	- 1
Hood Length:	- 10'0"
Hood Width:	- 48"
Lights:	- 1 fluorescent
Hot Water Flow (40 psi):	- 9.9 USGPM
Exhaust Specifications	
Exhaust Volume:	- 3000 cfm
No. of Duct Collars:	- 1
Size of Duct Collar:	- 10" X 27.0"
Static Pressure:	- 1.26" W.C.
Cold Water Specifications	
Cold Water Flow (20 psi):	- 0.35 USGPM

*Sample Hood Selection Printout from Spring Air Program
 Chart No. 3*

Engineering Data

Project Name:	- Sample
Item Number:	- EF-1
Model Number:	- KES30-30-I-H
Arrangement:	- indoor / horizontal
Unit Weight:	- 1100 lbs.
Exhaust Volume:	- 3000 CFM
External Static Pressure:	- 1.75" W.C.
Brake Horsepower:	- 4.66 Hp
Fan Speed:	- 2766 rpm
Exhaust Fan Motor:	- 5.00 Hp
Hi Voltage - FLA:	- 208V/3/60 - 15.6 AMPS.
Low Voltage:	- 120V/1/60 - 10 AMPS.
Remote Panel:	- model RPW10
Hoods Connected:	
Item #	Model#
H-1	CD-B-10/4
	Section#
	1

*Sample KES Enviro Filter Selection Printout from Spring Air Program
Chart No. 4*

Once again remember the Spring Air Systems sales representatives have a KES Enviro selection program. Contact your local representative and a selection can be made in minutes.

SAMPLE SPECIFICATION

Kitchen Enviro Filter Unit Specification

The commercial kitchen enviro filter box shall be a SPRING AIR SYSTEMS Inc. model no. KES___-___-I-H-S, indoor/outdoor design, horizontal/vertical arrangement, assembled, wired and tested prior to shipment with exhaust capacity of _____ CFM at _____" W.C. internal static pressure. The KES filter box shall be listed by Underwriters Laboratories Inc., Underwriters Laboratories of Canada and installed in accordance to the NFPA-96, the national building code, and local authorities having jurisdiction.

Unit Casing:

The filter box section casing shall be double wall, sandwich insulation construction. The inner wall shall be a minimum 16-gauge liquid tight and the outer wall shall be a minimum 18-gauge construction. The sandwiched insulation shall be 1.5" fiberglass. The unit casing shall be suitably reinforced to ensure rigidity. The filter section shall have a fire damper at the exhaust exit. Double walled, insulated, hinged access doors with cam lock fasteners shall be provided for entry to the filter sections. A fire damper shall be located in the filter section outlet.

Filter Section:

The KES unit shall include three stages of particulate filtration. The first stage shall be a 2" pleated UL/ULC Class 2 filter, rated at 30% ASHRAE 52-76. The second stage shall be a 22" bag filter, UL/ULC Class 2, rated at 90% ASHRAE 52-76. The third stage shall be a 12" box filter, UL/ULC Class 2, rated at 95% DOP or 99% ASHRAE 52-76.

Controls: Indoor Unit

The KES-ISH filter unit shall have a NEMA-1 LV10 J-Box, pressure switches, and a fire stat located on the unit. The LV10 J-BOX shall be interconnected to the KESF fan unit and a RPD10, or RPD10A or RPW10 remote panel.

Controls: Outdoor Unit

The LV10 J-Box, and pressure switches shall be located in a weatherproof enclosure with the motor starter and overload on the KESF fan unit. When the odor spray option is selected this enclosure will have a 300-watt baseboard heater and thermostat in cold climates. The unit shall include a firestat. The LV10 J-BOX shall be interconnected to a RPD10, RPD10A or RPW10 remote panel.

Remote Station Option:

RPD-10: Dry Hoods Manual Operation: For model FD/FN/DD/DN

The remote control station shall include a microprocessor for control and operation of the KES unit. There shall be pilot lights for NORMAL operation, FIRE, BOX FILTER CLOGGED, BAG FILTER CLOGGED, PREFILTER CLOGGED, FILTER REMOVED, and WARNING and unit ON/OFF and SERVICE OVERRIDE switches. When the odor spray option is selected the spray cycle and spray times are set at this panel.

RPD-10A: Dry Hoods Manual Automatic: For model FD/FN/DD/DN

The remote control shall include a microprocessor for control and 24-hour/7 day automatic operation of the KES unit. There shall be pilot lights for NORMAL operation, FIRE, BOX FILTER CLOGGED, BAG FILTER CLOGGED, PREFILTER CLOGGED, FILTER REMOVED, and WARNING and unit ON/OFF and SERVICE OVERRIDE switches. The KES automatic daily and weekly on/off times are set at this panel. When the odor spray option is selected the spray cycle and spray are set at this panel.

RPW-10: Wash hoods model CD/HD/CF/HF/CT/HT

The remote control shall include a microprocessor for control and operation of the KES unit. There shall be pilot lights for NORMAL operation, FIRE, BOX FILTER CLOGGED, BAG FILTER CLOGGED, PREFILTER CLOGGED, FILTER REMOVED, and WARNING and a SERVICE OVERRIDE switch. The KES on/off operation is controlled at the water wash panel. When the odor spray option is selected the spray cycle and spray are set at this panel.

Mechanical Services:

All exhaust ductwork from the kitchen hood to the KES inlet shall be supplied and installed in accordance to the NFPA-96. The KES exhaust discharge ductwork shall conform to local building code requirements.

Kitchen Enviro Fan Unit Specification:

The commercial kitchen enviro fan unit shall be a SPRING AIR SYSTEMS Inc. model no. KESF____, indoor/outdoor design, horizontal/vertical arrangement, assembled, wired and tested prior to shipment with exhaust capacity of _____ CFM at _____" W.C. total static pressure. The KES fan unit shall be listed by Underwriters Laboratories Inc., Underwriters Laboratories of Canada and installed in accordance to the NFPA-96, the national building codes, and local authorities having jurisdiction.

Unit Casing:

The exhaust fan motor and drive section shall be single wall construction with minimum 16 gauge wall and 1" sound attenuation insulation. The exhaust fan section shall be internally/externally spring isolated.

Exhaust Fan:

The KES unit shall be supplied with a CLASS II, AMCA rated double width, double inlet, (single width, single outlet SWSI) airfoil centrifugal fan statically and dynamically balanced. The fan shall be mounted on a heavy duty turned, ground and polished steel shaft, internally isolated, (externally isolated with hanging isolators shipped loose for field installation). The bearings shall be heavy-duty, prelubricated type. V-belt drives shall be two groove, adjustable up to 7.5 HP motors, sized with a capacity 25% greater than the motor horsepower. The exhaust fan shall be a ____ Hp, ____ V/3/60, TEFC motor.

Controls:**Controls: Indoor Unit**

The unit shall have a NEMA-3R disconnect switch and NEMA-1 motor starter and overload mounted on the KESF fan unit. The motor starter coil is connected to the LV-10 J-Box on the KES-ISH filter unit.

Controls: Outdoor Unit

The unit shall have a NEMA-4 disconnect switch, The LV10 J-Box, motor starter and overload and pressure switches shall be located in a weatherproof enclosure mounted on the KESF fan unit. When the odor spray option is selected this enclosure will have a 300-watt baseboard heater and thermostat in cold climates. The unit shall include a firestat. The LV10 J-BOX shall be interconnected to a RPD10 or RPD10A or RPW10 remote panel.

Odor Spray Option:

The Spring Air odor spray system shall include a reverse spray nozzle located upstream of the fan, air compressor unit, one gallons of Spring Fresh spray solution and associated piping. The odor spray package can be located on the KESF fan section or remote in the discharge duct from the KESF fan section. The remote control panel shall include a cycle timer and spray timer.

Odor Pellet Option:

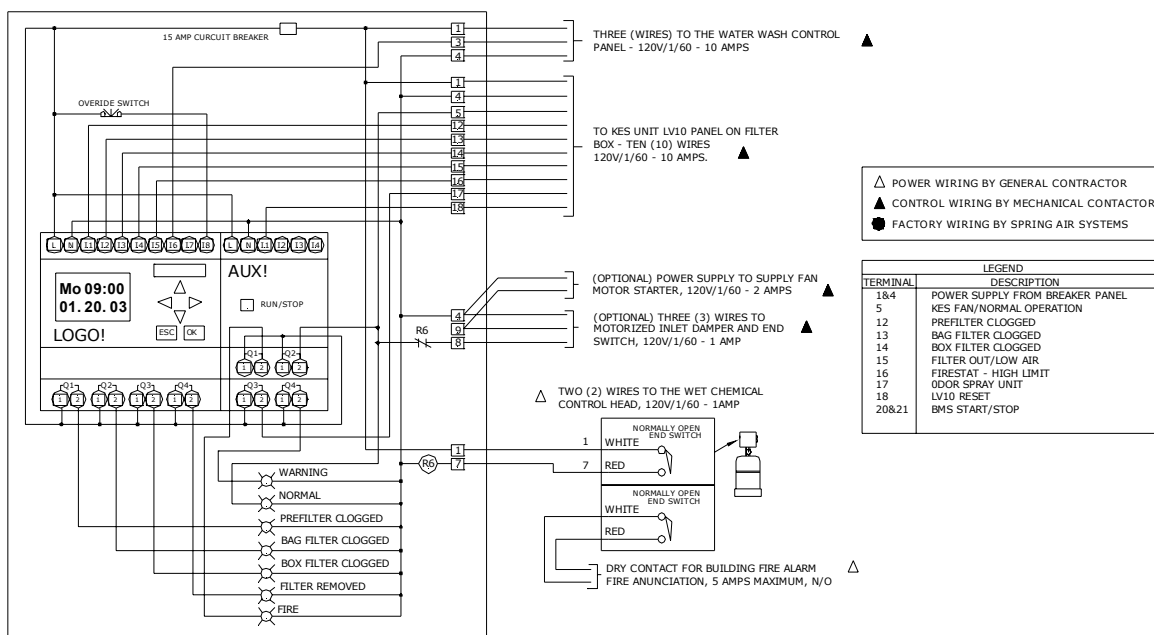
The unit shall include an odor removal section. The odor media shall consist of 2" perforated cells filled with activated alumina pellets impregnated with potassium permanganate. The odor system shall provide odor removal continuously during exhaust fan operation. The odor is controlled through a combination of sorption and the chemical modification of the gaseous contaminants. The odor media shall be non-flammable and non-toxic. The odor pellet package is normally located between the KES-ISH filter and KESF fan section.

Mechanical Services:

All exhaust ductwork from the filter box to the KESF fan inlet shall be supplied and installed in accordance to standard HVAC construction.

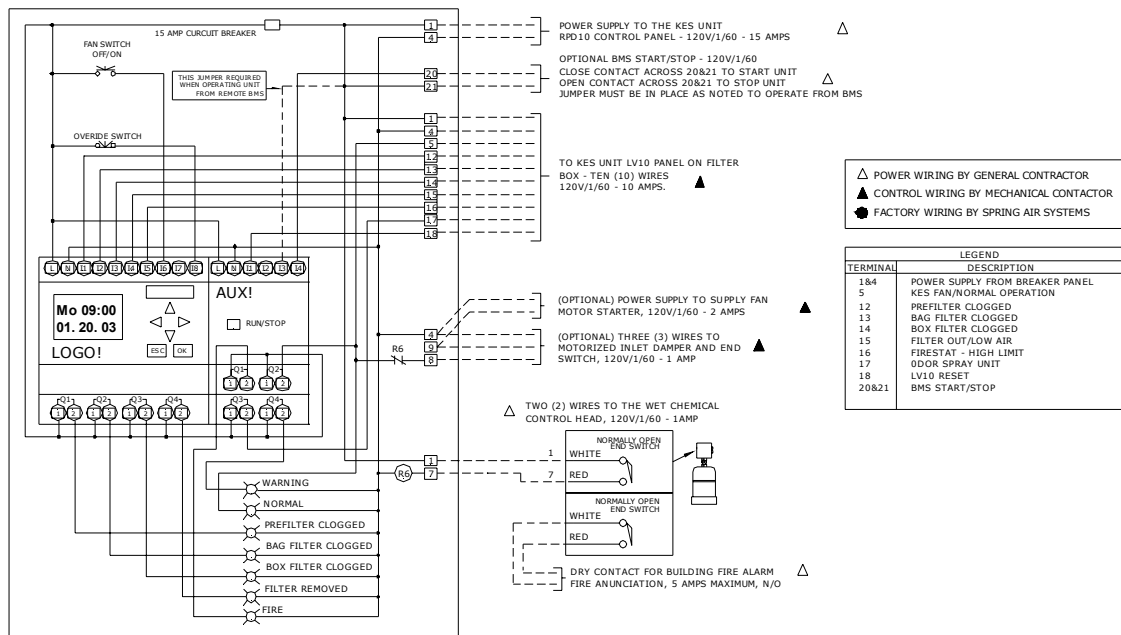
ELECTRICAL WIRING DIAGRAMS

RPW10 ELECTRICAL DATA



RPW10 Remote Panel Wiring Schematic
Figure 17

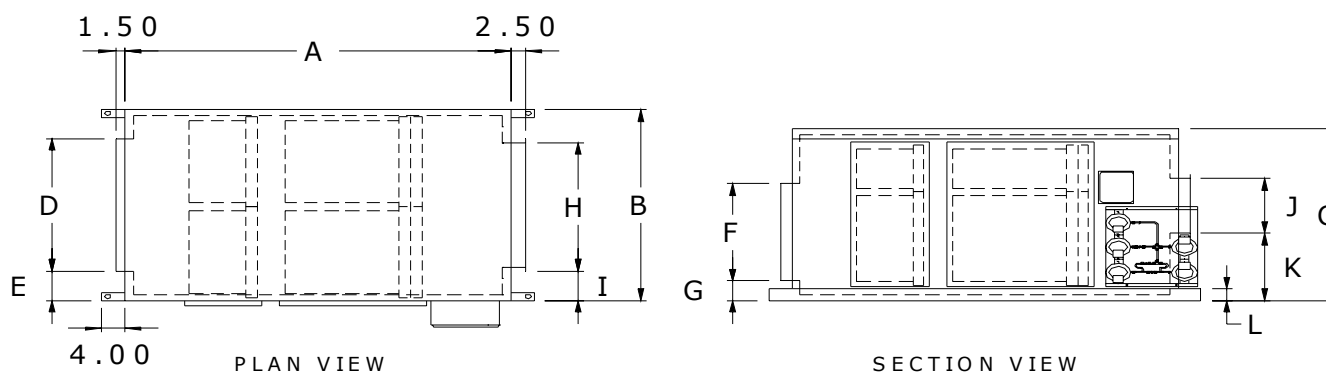
RPD10 ELECTRICAL DATA



RPD10 Remote Panel Wiring Schematic

Figure 18

KES-ISH INDOOR FILTER BOX

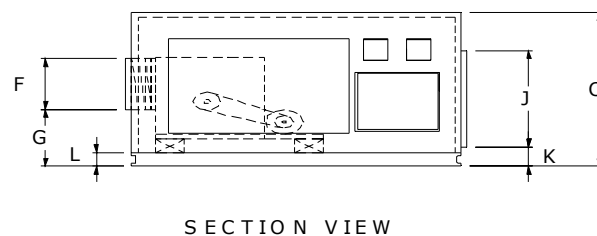
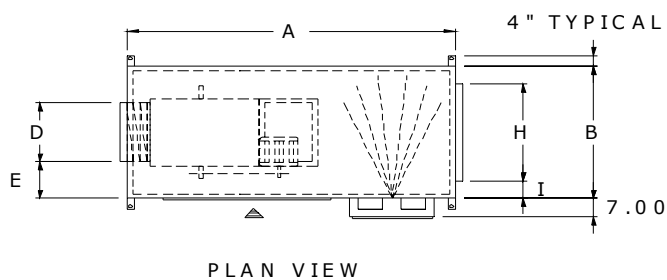


KES-ISH . Model No.	A	B	C	D	E	F	G	H	I	J	K	L
10	64	25.5	24.5	22.75	1.38	18	4.75	9	8.25	10	8.5	3
20	64	25.5	32	23	1.25	25	5	18	3.75	10	13.25	3
30	64	37.0	32	34	1.5	25	5	27	5	10	13.25	3
40	67	49.0	32	34	7.5	25	5	30	9.5	12	11.75	3
50	69	49.0	44	34	7.5	25	5	32	8.5	14	17.25	3
50F	69	60.5	32	34	13.25	25	5	32	14.25	14	11.25	3
60	69	49.0	44	38	5.5	25	5	34	7.5	16	16.25	3
60F	69	72.5	32	38	17.25	25	5	30	21.25	12	11.75	3
80	72	49.0	58	36	6.5	36	8	36	6.5	20	22.25	5
80F	72	72.5	45	44	14.25	36	6	36	18.25	20	15.25	4
100	76	60.5	58	44	8.25	48	7	36	12.25	24	20	5
120	81	72.5	58	44	14.13	48	7	36	18.25	30	17.25	5
140	85	72.5	70	56	8.25	54	7	40	13.25	32	21.5	5
160	86	72.5	70	56	8.25	54	7	40	16.25	36	20.25	5
180	86	72.5	82	60	6.25	54	7	42	15.25	40	24.25	5
200	86	96.0	70	60	18.0	54	7	50	23.00	36	20.25	5
240	86	96.0	82	72	12.0	54	7	60	18.00	36	26.25	5
280	86	96.0	94	72	12.0	60	7	70	13.00	36	32.25	5
320	86	96.0	106	72	12.0	72	7	72	12.00	40	36.25	5
360	86	107.5	106	72	17.75	72	7	80	13.75	40	36.25	5
400	86	119.5	106	84	17.75	72	7	90	14.75	40	36.25	5

Chart No. 5

KESF INDOOR FAN UNIT

DWDI and Odor Spray

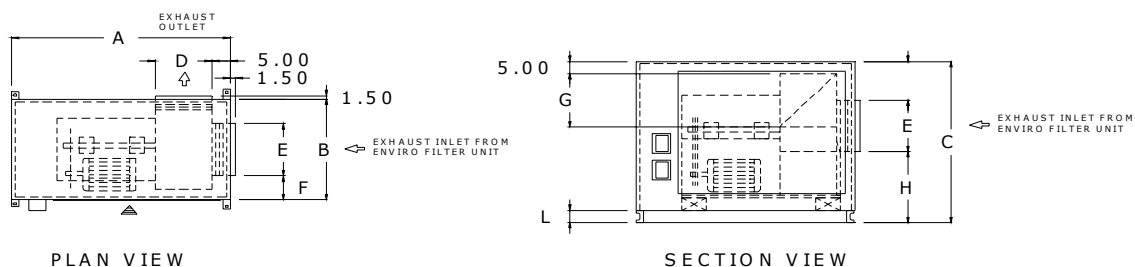


KESF MODEL No.	A	B	C	D	E	F	G	H	I	J	K	L
10	67	37	32	15.5	10.75	13.5	15.5	23	7	18	5	3
20	67	37	32	15.5	10.75	13.5	15.5	23	7	25	5	3
30	67	37	32	15.5	10.75	13.5	15.25	34	1.5	25	5	3
40	67	49	36	18.5	15.25	16	16.75	34	7.5	25	5	3
50	72	49	44	18.5	15.25	16	16.75	34	7.5	25	5	3
60	72	49	44	22	13.5	19	18.5	38	5.25	25	5	3
80	80	49	57	22	13.5	19	21	36	6.5	36	7	5
100	88	60.25	58	25.5	17.38	25.5	20.5	44	8.13	48	7	5
120	88	72.25	58	28	22.12	28	22.25	44	14.13	48	7	5
140	95	74.5	70	28	23.25	28	22.25	56	9.25	54	7	5
160	95	72.25	70	28	22.13	28	22.25	56	8.13	54	7	5
180	100	72.25	82	31.5	20.38	31.5	23.88	60	6.13	54	7	5
200	100	95.5	70	31.5	32	31.5	23.75	60	17.75	54	7	5
240	102	95.5	82	35.5	30	35.5	25.75	72	11.75	54	7	5
280	119	95.5	94	35.5	30	35.5	25.75	72	11.75	60	7	5
320	129	95.5	106	39.5	28	39.75	28	72	11.75	72	7	5
360	129	106.75	106	44.5	31.13	44.5	30.25	72	17.38	72	7	5
400	129	118.75	106	44.5	37.13	44.5	30.25	84	17.38	72	7	5

Chart No. 6

KESF INDOOR FAN UNIT

SWSI Fan

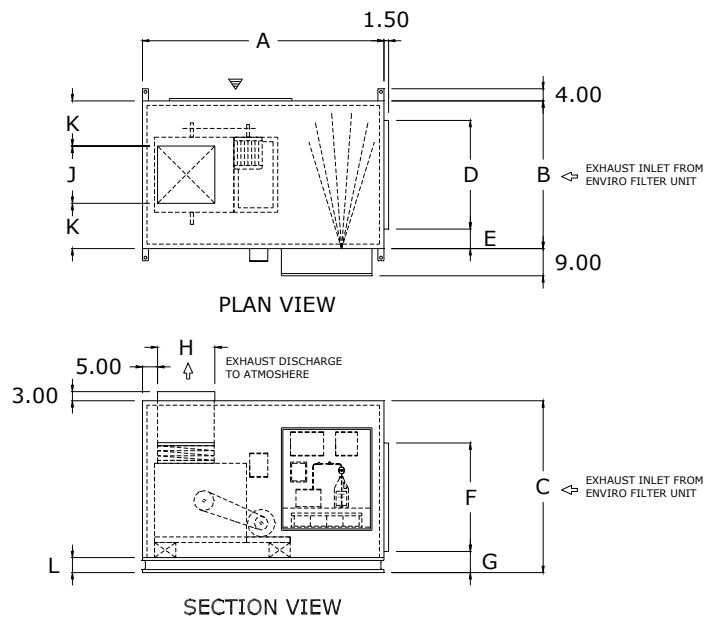


KESF Model No.	A	B	C	D	E	F	G	H	L
10	50	31	48.5	11	15	8	13	21.5	3
20	50	31	50	11	15	8	13	21.5	3
30	50	31	50	11	15	8	13	21.5	3
40	50	31	50	11	15	8	13	21.5	3
50	52	35	55	13	18	9	17.5	22	3
60	52	35	55	13	18	9	17.5	22	3
80	61	40	65	16	21	9.5	21.25	29	5
100	70	66	74	26.5	37	20.5	29.25	17	5
120	70	55	70	21.5	28.5	13.5	21	26.3	5
140	70	55	70	19	28.5	13.6	30	26.3	5
160	68	51	78	22	29	11	30	29	5
180	68	51	78	22	29	11	30	29	5
200	68	51	78	22	29	11	30	29	5
240	74	60	72	24	35	13	28	21	5
280	78	66	77	26	36	16	31.5	25	5
320	83	70	83	29	41	14	35	23.5	5
360	86	75	89	32	41	17	38.5	26.8	5
400	90	83	98	35	45	19	42	29	5

Chart No.7

KESF OUTDOOR FAN UNIT

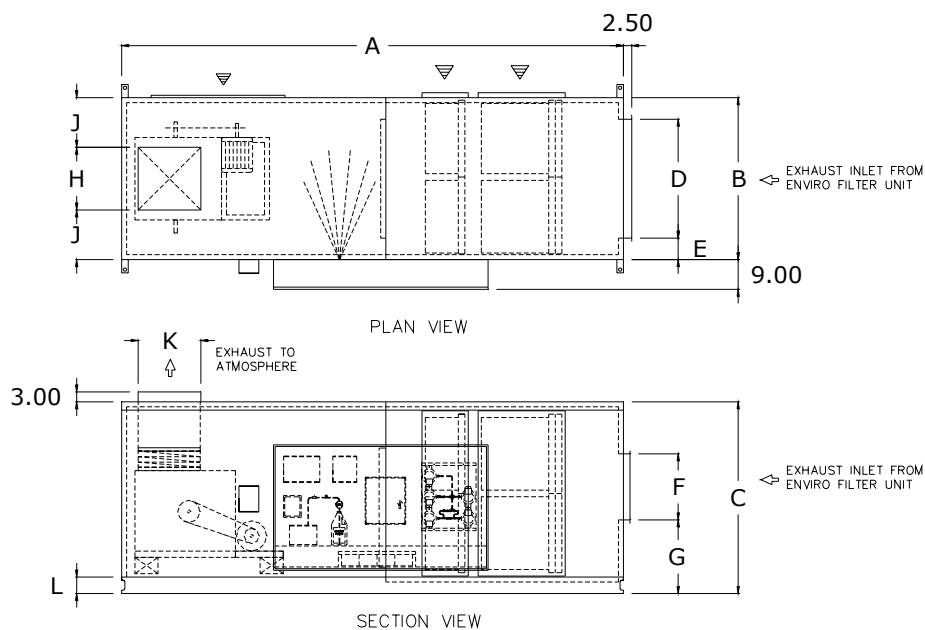
DWDI and Odor Spray



KESF Model No.	A	B	C	D	E	F	G	H	J	K	L
10	67	37	36	23	7	18	5	13.5	15.5	10.73	3
20	67	37	36	23	7	25	5	13.5	15.5	10.73	3
30	67	37	36	34	1.5	25	5	13.5	15.5	10.73	3
40	67	49	36	34	7.5	25	5	16	18.54	15.23	3
50	72	49	44	34	7.5	25	5	16	18.54	15.23	5
60	72	49	44	38	5.5	25	5	19	21.93	13.54	5
80	80	49	57	36	6.5	36	7	19	21.93	13.54	5
100	88	60.25	58	44	8.13	48	7	25	25.12	17.57	5
120	88	72.25	58	44	14.13	48	7	28.5	28.5	21.88	5
140	95	74.5	70	56	9.25	54	7	28.5	28.5	23	5
160	95	72.25	70	56	8.13	54	7	28.5	28.5	21.88	5
180	100	72.25	70	60	6.13	54	7	31.5	31.5	20.38	5
200	100	95.5	70	60	17.75	54	7	31.5	31.5	32	5
240	102	95.5	82	72	11.75	54	7	35.5	35.5	30	5
280	119	95.5	94	72	11.75	60	7	35.5	35.5	30	5
320	129	95.5	106	72	11.75	72	7	39.75	39.75	28	5
360	129	106.75	106	72	17.38	72	7	44.5	44.5	36.75	5
400	129	118.75	106	84	17.38	72	7	44.5	44.5	37.13	5

Chart No. 8

KES OUTDOOR COMPLETE UNIT



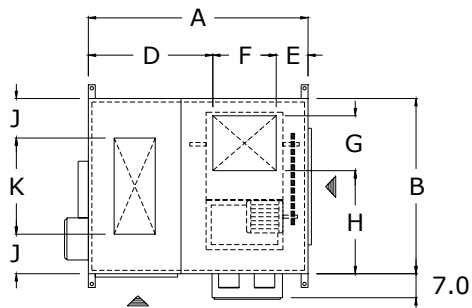
DWDI and Odor Spray

KES Model No.	A	B	C	D	E	F	G	H	J	K	L
10	131	37	43	9	8.25	10	8.5	15.6	10.7	13.5	3
20	131	37	43	18	3.75	10	13.25	15.55	10.73	13.5	3
30	131	37	43	27	5.0	10	13.3	15.6	10.7	13.5	3
40	134	49	43	30	9.5	12	11.75	18.54	15.23	16	3
50	141	49	44	32	8.5	14	17.25	18.54	15.23	16	3
60	141	49	44	34	7.5	16	16.25	21.93	13.54	19	3
80	152	49	58	36	6.5	20	22.25	21.93	13.54	19	5
100	164	60.5	58	36	12.25	24	20	25.12	17.69	25.43	5
120	169	72.5	58	36	18.25	30	17.25	28.5	22	28.5	5
140	180	72.5	70	40	16.25	32	21.5	28.5	22	28.5	5
160	181	72.5	70	40	16.25	36	20.25	28.5	22	28.5	5
180	186	72.5	82	42	15.25	40	24.25	31.5	20.5	31.5	5
200	186	96	70	50	23	36	20.25	31.5	32.25	31.5	5
240	188	96	82	60	18	36	26.25	35.5	30.25	35.5	5
280	205	96	94	70	13	36	32.25	35.5	30.25	35.5	5
320	215	96	106	72	12	40	36.25	39.5	28.25	39.75	5
360	215	107.5	106	80	13.75	40	36.25	44.5	31.5	44.5	5
400	215	119.5	106	90	14.75	40	36.25	44.5	37.13	44.5	5

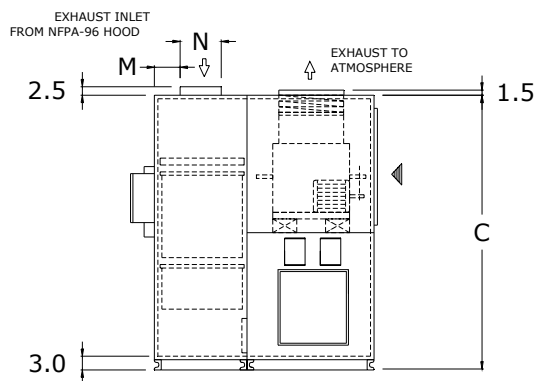
Chart No. 9

KESF INDOOR VERTICAL COMPLETE UNIT

DWDI and Odor Spray



PLAN VIEW



SECTION VIEW

KES-IV Model No.	A	B	C	D	E	F	G	H	J	K	M	N
10	48	42	78	23.7	8.75	15.55	13.45	25.55	16.5	9	3	10
20	60	42	78	35.73	8.72	15.55	13.45	26.55	12	18	8.5	10
30	60	42	78	35.7	8.75	15.55	13.45	26.55	7.5	27	8.5	10
40	64	51	80	36.21	9.25	18.54	15.87	33.13	11.5	28	7.5	12
50	80	51	84	50.21	11.25	18.54	15.87	33.13	10	31.5	12.5	14
60	84	51	84	50.58	11.5	21.93	18.78	30.22	6.25	38.5	12.5	14
80	96	55	90	62.57	11.5	21.93	18.78	34.22	9.75	36	12.5	26
100	107	66	90	66.38	15.5	25.12	25.12	38.88	17	32	11.5	28

Chart No. 10

KES UNIT WEIGHT CHART (lbs)

KES Model Number	KES-ISH Filter Box	KESF Fan Unit DWDI	KESF Fan unit SWSI	KESV Vertical unit	Odor Pellet Section	Odor Spray Section
10	250	630	550	950	200	100
20	300	630	600	1050	300	100
30	350	710	700	1100	450	110
40	450	710	800	1300	500	110
50	550	950	1000	1650	550	150
50F	550	n/a	n/a	n/a	550	150
60	600	950	1100	1750	600	150
60F	650	n/a	n/a	n/a	600	150
80	700	1300	1350	2100	900	170
100	850	1600	1500	2550	1050	190
120	950	1700	1950	n/a	1250	200
140	1050	1850	2050	n/a	1450	220
160	1150	2250	2300	n/a	1600	250
180	1200	2300	2550	n/a	1850	250
200	1250	2450	2550	n/a	1950	275
240	1400	2750	2650	n/a	2400	300
280	1500	3150	3450	n/a	2600	350
320	1650	3700	4050	n/a	3100	400
360	1800	4350	4350	n/a	3300	465
400	1950	5000	4850	n/a	3800	550

Chart No.11

Notes:

- 1.KES Filter box discharge outlet duct dimensions are sized to suit the KES fan section inlet dimensions.
 - 2.For outdoor units add 250 lbs. to the weight of the KESF and KES-ISH.
 - 3.The KESF fan units with DWDI fans and internal or external isolation are available with exhaust discharge positions: UB up blast, DB down blast and TB straight through discharge.
- The KESF fan units with SWSI fans and internal or external isolation are available with exhaust discharge positions: RB right discharge, LB left discharge, UB up blast and DB down blast. Right and left discharge based on looking into fan inlet. Access doors can be RS right side or LS left side based on looking into inlet of unit.

Other Fine Products From

SPRING AIR SYSTEMS...

- Water Wash Ventilators
 - ◆ Hot Water Wash
 - ◆ Cold Water Spray/Hot Water Wash
 - ◆ Water Wash Control Panels
- Dry Extractor Hoods
- ***REV-LOW*** Hoods
- Cartridge Hoods
- Filter Hoods
- Surface Fire Suppression
- Commercial Kitchen Exhaust Fans
- Kitchen Enviro Systems
 - ◆ KES - 100% Exhaust
- Commercial Kitchen Supply Units
- Compensating Hoods
- Exhaust Fans
- Supply Fans
- Commercial Kitchen Control Panels
- Variable Speed Exhaust/Supply Systems

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